

CLAIMS

1. A measurement apparatus for ulcerative colitis diagnosis and prognostic test comprising:

a solution mixing unit for mixing an eluent and a quinone solution, said eluent being supplied from a separation system including an eluent tank in which the eluent used for acid separation is stored, at least one pump for sending the eluent, a sample injection unit for injecting a sample into the eluent, and an acid separation column for separating short-chain fatty acids included in the sample that is injected from the sample injection unit, and said quinone solution being supplied from a solution sending system including a solution tank in which the quinone solution containing quinone and supporting electrolyte is stored, and at least one pump for sending the quinone solution; and

an acid degree measurement unit for measuring the acid degrees of the short-chain fatty acids included in a mixture solution that flows from the solution mixing unit;

wherein said acid degree measurement unit continuously measures the acid degrees of the short-chain fatty acids included in the sample, which are successively mixed into the quinone solution by the solution mixing unit.

2. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in Claim 1, wherein

said solution mixing unit includes a main tube in which the quinone solution flows, and a side tube in which the eluent flows, and

said side tube penetrates into the main tube so that an aperture plane of a front end thereof is parallel to an inner diameter plane of the main tube.

3. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in Claim 2, wherein

in said solution mixing unit, a cross-section area of the front end of the side tube is $1/3$ or lower relative to an inner cross-section area of the main tube.

4. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 3, comprising:

said acid degree measurement unit including

a working electrode in which electrochemical reaction of the quinone proceeds,

a reference electrode serves as a basis for a voltage control of the working electrode, and

a counter electrode that makes a pair with the working electrode to flow a current; and

measuring a current of the quinone that flows through the working electrode in a state where a voltage is applied to the working electrode so that it has a constant voltage over the

reference electrode.

5. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 4, wherein

said acid separation column is an ion exclusion type column for separating a target sample by a difference in electrostatic repulsive forces of ions having the same charge as an ion-exchange group.

6. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 5, wherein

a degasser for removing bubbles and dissolved oxygen included in the quinone solution and the eluent is provided in a flow path from the eluent tank and a flow path from the solution tank, respectively.

7. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 6, wherein

the flow rate of the eluent to the acid separation column is 7.96mm/min~60.2mm/min.

8. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 7, wherein

the flow rate of the quinone solution is 891mm/min~5102mm/min.

9. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 8, wherein
said eluent is a water solution containing 0.1mM of perchloric acid.
10. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 9, wherein
said quinone solution is an ethanol solution containing 3mM~6mM of quinone and 50mM~150mM of lithium perchlorate.
11. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 10, wherein
said sample is human stool containing six kinds of short-chain fatty acids which are lactic acid, acetic acid, propionic acid, butyric acid, isovaleric acid, and valeric acid.
12. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 11, wherein
the acid degree measurement unit enables measurement up to an acid measurement sensitivity of $5\mu\text{M}$ ~2mM.
13. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in any of Claims 1 to 12, wherein
the length of a flow path provided between the solution

mixing unit and the acid degree measurement unit is 20mm~80mm.

14. A measurement method for ulcerative colitis diagnosis and prognostic test comprising:

an acid separation step of injecting a measurement sample into an eluent that flows into an acid separation column at a constant flow rate, and separating short-chain fatty acids included in the measurement sample by the acid separation column;

a solution mixing step of mixing the eluent that is sent from the acid separation column into a quinone solution that contains quinone and supporting electrolyte and is sent at a constant flow rate; and

an acid degree measurement step of continuously measuring the acid degrees of the short-chain fatty acids in the mixture resultant which is produced by the measurement sample, being successively mixed into the quinone solution in the liquid mixing step.

15. A measurement apparatus for ulcerative colitis diagnosis and prognostic test as defined in Claim 14, wherein

said solution mixing step comprising:

forming a flow path by mixing a flow in a side tube which comprises the eluent flow, into a flow in a main tube which comprises the quinone solution flow; and

discharging the eluent that flows from the side tube in

parallel to the quinone solution that flows in the main tube,
thereby to evenly diffuse the eluent into the quinone solution..